Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

LIBRARY RECORD
OCT 23 1959
U.S. DEPARTMENT OF AGRICULTURE

622
R312
f. 2

Research Note

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

INTERMOUNTAIN FOREST & RANGE EXPERIMENT STATION
OGDEN UTAH

No. 70 August 1959

REDUCING DOUGLAS-FIR BEETLE DAMAGE--HOW IT CAN BE DONE

Malcolm M. Furniss[1/]
Division of Forest Insect Research

Foresters in the Intermountain and northern Rocky Mountain areas have sometimes despaired of controlling infestations of Douglas-fir beetle. Few major forest insect pests exceed the beetle in destructiveness. Its usual host, Douglas-fir, leads all other species in volume of lumber produced in the United States. Why, then, has this beetle attained a position so favorable to itself in western forests? Why, in comparison with other insect pests, has so little remedial action been taken against it?

Several factors explain the situation confronting managers of interior Douglas-fir stands. Adverse factors not readily manipulated are: steep terrain, inaccessibility, low stumpage value, and small volume per tree. Added to this list are: difficulty in detecting infested trees, expense of chemical control, and the fact that tree killing may increase or decrease abruptly without evident cause.

This paper presents initial results of a study begun in southern Idaho in 1956 with the hope that this information may be useful to forest managers. The geographic data covered by this study have been somewhat limited, but infestations in southern Utah and in western Montana, as well as those in Idaho, have been observed or sampled. Further recommendations may follow as more information is gained and additional areas are examined.

BIOLOGY

Biology of the Douglas-fir beetle has been reported by Bedard[2/] and others. Native to all areas inhabited by Douglas-fir, the beetle kills its host by mining the inner bark, where it lays eggs. Developmental stages are

---

1/ Entomologist, Intermountain Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture, stationed at research center Boise, Idaho.

2/ Bedard, W. D. 1950. The Douglas-fir beetle. U.S. Dept. Agr. Cir. 817, 10 pp., illus.

shown in figure 1. One generation matures per year. Most adults emerge in May to infest fresh host material. Others emerge in summer, but these are relatively unimportant in interior stands because they are greatly outnumbered by spring brood. Also, they tend to infest green portions of trees already attacked by spring brood. For these reasons, discussion of biology has been simplified for this report, and control recommendations are directed mainly at spring brood.

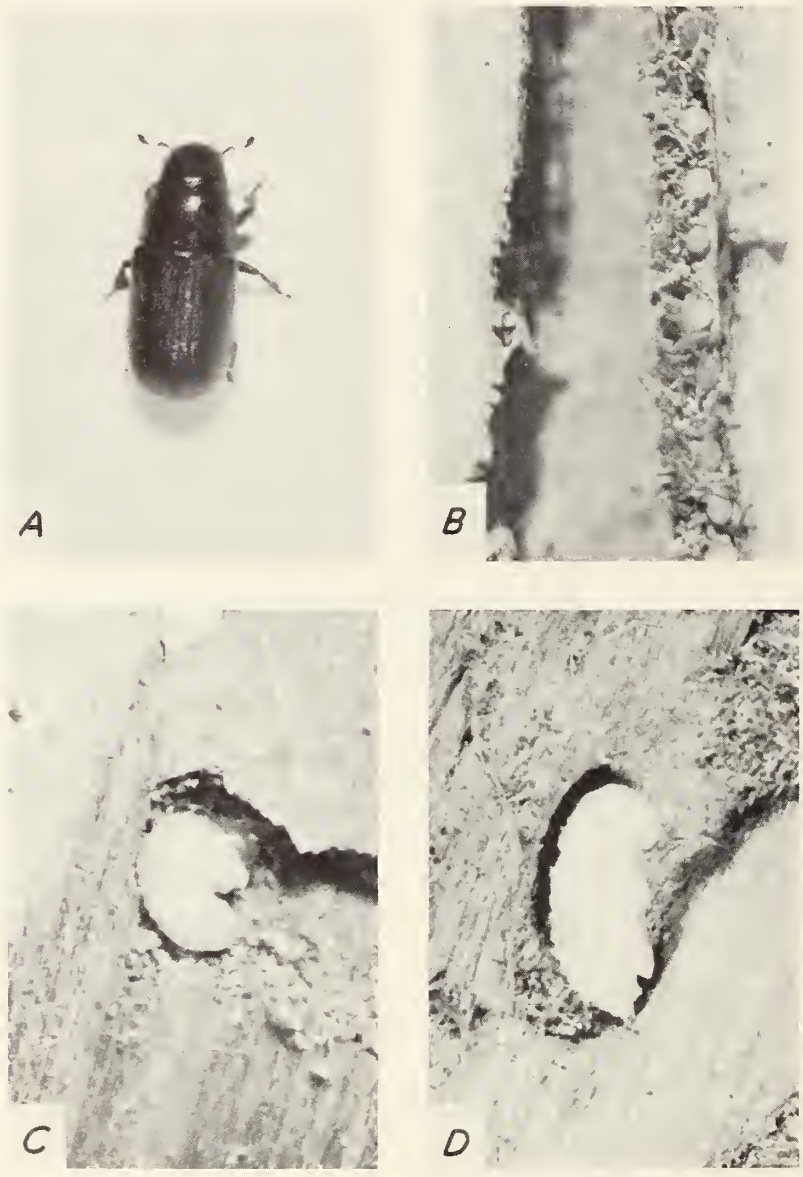

Figure 1.—Developmental stages of the Douglas-fir beetle: A, adult, x 7; B, eggs on side of egg gallery, x 7; C, larva, x 7; D, pupa, x 7.

CHARACTERISTICS OF INFESTATION

Small size and the habit of spending most of its existence beneath the bark make this beetle inconspicuous and difficult to detect. However, effective control requires that infested trees be located as early as possible. This is difficult because infested trees look normal long after initial infestation.

Indicators of infestation are: (1) orange bark fragments (frass) expelled by the females as they enter the bark at fissures; (2) streams of clear pitch exuding from the top of infested area; (3) reddening of foliage commencing in late summer or (more often) in the following spring.

Use of frass and pitch streamers to locate infested trees has the great advantage of being applicable immediately after attack, but it requires that a suspected stand be examined intensively on the ground. Under ideal conditions, i.e., soon after attack, the frass on infested trees may be seen from a distance of 10 to 15 feet. Thereafter, frass may be removed by wind and rain, and the observer must take great care not to overlook the small amount of boring dust remaining in the bark crevices. Detection is often improved by looking for clear pitch streamers on the bole at the top of the infested portion; the exact height where they appear varies from tree to tree. Pitch streamers, present on many trees, may be seen from a distance of 30 to 50 yards depending upon lighting and quantity of pitch exuded. Field glasses help an observer detect infested trees from even greater distances.

Fading of foliage may be seen from ground or air. If looked for in late summer, only one or a few trees in an infested group may exhibit fading. Such fading may appear quite mottled and may be confined to only a branch here and there. With experience, one can differentiate this type of fading from other foliage ailments.

Tendency of the beetle to attack trees in groups is a great advantage to the control operation. This behavior facilitates detection of infestations because it allows a spotter to follow an easier route that permits him to examine, say, every third tree or natural groups of Douglas-fir without danger of missing an infested group. Once he encounters an infested tree he knows that more are in the vicinity and should be sought out exhaustively. Groupwise occurrence of loss also has an economic advantage in salvage control (fig. 2).[3/] Groups can be logged more cheaply than scattered trees: this is especially true in southern Idaho where an average size infested Douglas-fir may be 20 inches in diameter, 100 feet tall, and may contain less than 500 board feet volume.

3/ The removal of infested merchantable trees by logging.

Figure 2.--Salvage logging is one method of combatting Douglas-fir beetle infestations.

RECOMMENDATIONS FOR CONTROL

Key to Success: Start Early

Timing of control, regardless of method used, has utmost importance. Control must be undertaken during the 1-year interval between beetle attack and emergence, but experience indicates that chances for success are best when control action is begun as early as possible. Bark becomes progressively more dry and loose as the brood develops. By spring, 1 year after initial attack, it is virtually impossible to skid an infested log without tearing off bark. Callow adults, scattered about the woods, may survive in numbers sufficient to continue the infestation. Another disadvantage to delaying control action until spring is that snow and mud interfere with operations. If chemical control is used, wet bark may lessen effectiveness of chemicals and result in lower mortality. However, some operations that were begun during the previous fall may have to be completed in the spring.

Insecticides are Available

Results of tests to control Douglas-fir beetle with bark-penetrating insecticides have been reported by Gibson[4/] and others. In some situations this means of control is best. Usually, high values and rapidly expanding infestations are involved. Perhaps chemical control will be most useful in supplementing other methods of control. For example, infested trees in inaccessible locations might receive chemical treatment adjacent to an area where salvage logging was employed to remove most infested trees.

Or, upon termination of harvest cuttings, brood-laden logging slash might be sprayed with insecticide to prevent possible damage to residual trees. Other uses for insecticides could be cited, but the greatest present need is for discussion of methods other than chemical treatment of combatting or preventing damage.

Windthrow Should be Salvaged

The beetle prefers down trees although density of galleries may be less than in standing trees. Because the shaded underside of the bole has lower surface temperature, most attacks occur there. Relative survival of beetles is likely to be greater in down trees. Because it is sometimes difficult to detect, windthrow probably has been more important in past outbreaks in interior stands than has been indicated. Salvage of windthrow soon after it has become infested will prevent the possibility of breeding large numbers of beetles.

Silvicultural Treatment

Observation within logged areas indicates that harvesting of timber has a three-fold tendency to prevent beetles from destroying live trees. A supply of felled trees in the spring attracts and absorbs the emerged beetles. Taking infested logs to the mill removes some beetles from an area. Lastly, conversion to a younger, faster growing stand leaves the trees better able to resist attacks of normal beetle populations.

Even in unmanaged stands, where average age of infested trees was more than 150 years, about 30 percent of attacked trees survived. Such trees, as evidenced by pitch-impregnated galleries and absence of larval mines, should never be cut in any control operation. Some individuals believe that unsuccessfully attacked trees will surely become infested the following year, but evidence does not support this notion. Possible benefit from leaving trees that have passed such a severe test far outweighs any risk in leaving them.

4/ Gibson, Archie L. 1957. Tests of bark-penetrating insecticides to control the Douglas-fir beetle. Jour. Econ. Ent. 50: 266-268.

What About Trap Trees?

Trap trees may eventually prove to be useful in combatting Douglas-fir beetle infestations. However, their use now would be on a hit-or-miss basis and could be expected to produce variable results depending upon circumstances. While the attractiveness of felled trees is well established, the amount, distribution, and timing of cutting remain to be determined in relation to density and distribution of anticipated beetle population. It is also probable that wherever use of trap trees might be under consideration it would be feasible to remove infested trees without cutting trap trees.

Are Certain Tree Classes Preferred?

Opinion is divided as to whether initial attacks occur in especially attractive trees or simply at random. However, there is general agreement that attacks create attractive odors caused by fermenting phloem. Apparently, beetles attracted to the vicinity of the first attacked tree overflow into surrounding trees; the ultimate number of infested trees depends upon the number of beetles in the area. Present knowledge indicates that such losses appear to be concentrated in older trees. However, selection of a particular vigor or dominance class in the preferred age group has not been demonstrated conclusively.

WHAT SHOULD BE THE LAND MANAGER'S POSITION?

How should Douglas-fir beetle infestations in interior stands be treated? Some adverse factors have been singled out that partially account for the relative scarcity of remedial action. On the other hand, several highly favorable circumstances have been discussed. Tendency to attack in groups, preference for felled trees and older trees, and evidence that tree resistance can be increased by silvicultural methods, are favorable to successful control.

Although additional knowledge about this beetle is needed, existing information concerning its control should be applied vigorously. In this way the beetle can be relegated to a lesser position amongst forest insect pests. Also, application of various control practices will permit evaluating and improving them for future use.